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Growth and yield of hybrid Napier (*Pennisetum purpureum* Schumach.) genotypes as influenced by planting geometry and nutrient management

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ABSTRACT

A field experiment entitled "Growth and Yield of Hybrid Napier (*Pennisetum purpureum* Schumach.) Genotypes as Influenced by Planting Geometry and Nutrient Management" was conducted during year 2025-26 at Main Agricultural and Horticultural Research Station, Iruvakk, Shivamogga, Karnataka. The results of the experiment showed that among the treatments, (T_{12}) Suguna genotype at 60 x 60 cm spacing with split application of nitrogen and potassium (180:120:80 kg NPK ha⁻¹, N and K applied in six equal splits) showed significantly higher values of number of tillers hill-1 (35.87), number of leaves hill-1 (312.44), leaf:stem ratio (1.54), green fodder yield (296.69 t ha⁻¹) and dry fodder yield (42.49 t ha⁻¹), respectively. However, it was on par with T_{11} (Suguna at 60 x 60 cm spacing with split application of nitrogen alone), which recorded 34.02 tillers hill-1, 298.17 leaves hill-1, leaf:stem ratio of 1.50, green fodder yield of 283.55 t ha⁻¹ and dry fodder yield of 40.36 t ha⁻¹. With respect to plant height, significantly the tallest plants were recorded in Super Napier at 60 x 60 cm spacing with split application of nitrogen and potassium (T_4) with a mean of 258.59 cm, on par with Super Napier at 60 x 60 cm spacing with nitrogen alone (T_3) at 249.57 cm, while for per plant yield, significantly the highest value was recorded in Suguna at 90 x 60 cm spacing with nitrogen and potassium (T_{10}) at 2.33 kg plant⁻¹. Significantly the lowest values for tillers, leaves, leaf:stem ratio and fodder yield were recorded in Red Napier at 90 x 60 cm spacing with split application of nitrogen alone, while the shortest plants were recorded in Suguna at 90 x 60 cm spacing with split application of nitrogen.

Keywords: Hybrid Napier, Planting geometry, Nutrient management, Nitrogen and potassium, Green fodder yield

Introduction

Green fodder is the main constraint on livestock productivity in India, which is short of green fodder, dry fodder and concentrates (Krishnaveni, 2019) [1]. Since land for fodder cannot be expanded much, the need is for high-yielding perennial grasses that supply green forage round the year. Hybrid Napier (Bajra Napier hybrid) suits this purpose because of its high yield, palatability and adaptability to varied soil and climatic conditions (Velayudham et al., 2011) [2]. It can remain on the same field for three to four years, and repeated ratooning gives a continuous supply of green forage (Biradar et al., 2020) [3].

Many hybrid Napier genotypes have been released, and they differ in plant height, tillering, leaf-stem ratio and green fodder yield, so their suitability has to be judged under local conditions (Biradar et al., 2020) [3]. Super Napier, Red Napier and Suguna are now widely grown by dairy farmers, but there is little comparative information on their performance in the Hilly Agro-Climatic Zone of Karnataka.

Yield in a multi-cut perennial grass also depends on crop management, especially plant spacing and nutrient supply. Spacing determines plant population, tillering and light interception, and the optimum varies with location and genotype (Velayudham et al., 2011; Khadda et al., 2016) [2, 4]. Nutrient supply is equally important because every harvest removes large amounts of nutrients from the soil. Napier grass responds strongly to nitrogen, and it also removes large quantities of potassium (Vicente-Chandler et al., 1959) [5]. Nitrogen is normally top-dressed after each cut, but information on potassium application for Bajra Napier hybrids is limited. Splitting the nitrogen and potassium dose across the crop's growth stages, rather than applying it all at planting, tends to give the best returns, largely because the crop's continuous growth habit calls for a steady nutrient supply and single large doses are prone to loss through leaching, runoff or volatilization (Niranjana et al., 2018) [6].

There is little information on how genotype, spacing and the schedule of nutrient application interact in hybrid Napier under the conditions of Zone 9 of Karnataka. The present investigation was therefore carried out to evaluate Super Napier, Red Napier and Suguna at two spacings under split application of nitrogen alone and of nitrogen with potassium at each harvest.

Material and method

The study was carried out during 2025-26 at the Main Agricultural and Horticultural Research Station, Iruvakk (KSNUHAS), Shivamogga (14° 0' N Lat and 75° 42' E Long) at an altitude of 620 m above mean sea level, situated in the Hilly Agro-Climatic Zone (Zone 9) of *Karnataka*. The experiment comprised three hybrid napier genotypes, namely Super Napier, Red Napier and Suguna, evaluated under two spacings and two nutrient split-application schedules. Planting was carried out on 1st August 2025 using healthy, three-noded stem cuttings of uniform age, spaced at 90x60 cm and 60x60 cm. The experiment was laid out in Randomized Complete Block Design with three replications. The following are the details of treatments T₁- Super Napier with 90x60 cm spacing and split application of N at each harvest, T₂- Super Napier with 90x60 cm spacing and split application of N and K at each harvest, T₃- Super Napier with 60x60 cm spacing and split application of N at each harvest, T₄- Super Napier with 60x60 cm spacing and split application of N and K at each harvest, T₅- Red Napier with 90x60 cm spacing and split application of N at each harvest, T₆- Red Napier with 90x60 cm spacing and split application of N and K at each harvest, T₇- Red Napier with 60x60 cm spacing and split application of N at each harvest, T₈- Red Napier with 60x60 cm spacing and split application of N and K at each harvest, T₉- Suguna with 90x60 cm spacing and split application of N at each harvest, T₁₀- Suguna with 90x60 cm spacing and split application of N and K at each harvest, T₁₁- Suguna with 60x60 cm spacing and split application of N at each harvest and T₁₂- Suguna with 60x60 cm spacing and split application of N and K at each harvest. Here, three genotypes of hybrid napier were combined with two

planting geometries and two nutrient scheduling patterns, giving twelve treatment combinations, each replicated thrice, with a gross plot size of 5.4 x 4.8 m and a net plot size of 3.6 x 3.6 m for 90x60 cm spacing and 4.2 x 3.6 m for 60x60 cm spacing.

Result and discussion

Plant height (Table 1), number of tillers per clump (Table 2), number of leaves per clump (Table 3) and leaf:stem ratio (Table 4) differed significantly among treatments under the different planting geometries and nutrient management. Plant height, tillers and leaves increased from the first to the sixth harvest, and the differences among treatments were significant at every stages.

Plant height

T₄ recorded the tallest plants (211.83 cm at the first harvest to 290.51 cm at the sixth; mean 258.59 cm), on par with T₃ (218.29 to 281.29 cm; mean 249.57 cm). T₁₀ was significantly the shortest throughout (153.19 to 231.31 cm; mean 198.10 cm). The taller stature of T₄ can be explained by intra-row competition for light, where mutual shading forces internode elongation (a shade-avoidance response). Split N and K further supported cell elongation, chlorophyll synthesis and turgor-driven growth. *Nascimento et al. (2021)* [17] reported that synchronizing K with N through split fertilization enhanced forage biomass production. *Dokbua et al. (2021)* [18] found that combined N and K significantly enhanced growth and biomass productivity of hybrid napier. The short stature of T₁₀ agrees with *Seeja et al. (2006)* [9], who described Suguna as a profusely tillering but comparatively short-statured Bajra-Napier hybrid.

Table 1. Plant height (cm) of Hybrid Napier genotypes influenced by planting geometry and nutrient management at successive harvests.

Treatment		Plant height (Cm)						Average
		1 st harvest	2 nd harvest	3 rd harvest	4 th harvest	5 th harvest	6 th harvest	
T ₁	Super Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	207.60	220.55	231.91	243.46	255.15	267.02	237.61
T ₂	Super Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	201.42	223.75	235.39	247.24	259.26	271.50	239.76
T ₃	Super Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	218.29	232.76	244.60	256.64	268.86	281.29	249.57
T ₄	Super Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	211.83	242.43	254.56	266.92	278.60	290.51	258.59
T ₅	Red Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	178.85	196.63	207.77	219.19	230.85	242.74	212.67
T ₆	Red Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	172.71	201.86	213.38	225.17	237.22	249.51	216.64
T ₇	Red Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	190.60	209.91	221.64	233.63	245.90	258.37	226.68
T ₈	Red Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	184.94	215.49	227.45	239.71	252.28	265.06	230.82
T ₉	Suguna with 90 cm x 60 cm spacing and split application of N at each Harvest	158.73	177.50	188.94	200.60	212.48	224.60	193.81
T ₁₀	Suguna with 90 cm x 60 cm spacing and split application of N and K at each Harvest	153.19	183.34	194.96	206.84	218.97	231.31	198.10
T ₁₁	Suguna with 60 cm x 60 cm spacing and split application of N at each Harvest	167.07	191.39	203.24	215.36	227.74	240.38	207.53
T ₁₂	Suguna with 60 cm x 60 cm spacing and split application of N and K at each Harvest	161.93	197.45	209.52	221.90	234.62	247.67	212.19
S.Em ±		7.46	8.08	8.53	9.00	9.47	9.95	8.70
CD at 5%		21.89	23.70	25.03	26.39	27.77	29.18	25.51

No. of tillers per clump

Tillering is the most important agronomic trait of a perennial fodder grass. Tillers per clump increased with each harvest and differed significantly among treatments (Table 2). At the first harvest, T₉

recorded the most tillers (21.42 tillers/clump), on par with T₁₀ (19.75). From the second harvest onward T₁₀ led (30.54 to 61.17), on

par with T₉ (28.79 to 57.88). T₇ was significantly the lowest throughout (11.50 to 27.61). The wider spacing (90 × 60 cm) in T₉ and T₁₀ let more lateral light reach the basal buds and released them from apical dominance. This is consistent with Gardner *et al.* (1985) [10], who reported that tillering in forage grasses is strongly influenced by light, temperature, planting geometry and N nutrition. The superior tillering of T₉ and T₁₀ also corroborates Seeja *et al.* (2006) [9], who reported that Suguna produces about 40 tillers per plant, among the highest of

the released Bajra-Napier hybrids, as also noted by Jat *et al.* (2011) [11] in the context of split-nutrient management improving synchronisation between supply and demand across growth stages. The low tiller number in T₇ reflects early shading of basal buds under the closer spacing, which diverts resources towards height rather than tiller initiation. This was compounded by the lower tillering tendency of Red Napier.

Table 2. No. of tillers per clump of Hybrid Napier genotypes influenced by planting geometry and nutrient management at successive harvests.

Treatment		No. of tillers per clump						Average
		1 st harvest	2 nd harvest	3 rd harvest	4 th harvest	5 th harvest	6 th harvest	
T ₁	Super Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	15.64	20.91	30.87	38.91	40.53	41.75	31.46
T ₂	Super Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	13.83	22.44	32.69	41.57	43.43	44.78	33.13
T ₃	Super Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	12.75	17.57	24.54	31.81	33.19	34.22	25.68
T ₄	Super Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	13.26	19.38	25.70	34.16	35.42	36.51	27.44
T ₅	Red Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	14.05	19.72	28.34	37.37	39.25	40.49	29.87
T ₆	Red Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	13.15	21.82	29.47	39.36	41.34	42.62	31.31
T ₇	Red Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	11.50	17.46	21.72	25.62	26.75	27.61	20.12
T ₈	Red Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	10.31	18.52	24.51	29.98	31.19	32.16	24.45
T ₉	Suguna with 90 cm x 60 cm spacing and split application of N at each Harvest	21.42	28.79	43.92	54.30	55.96	57.88	43.74
T ₁₀	Suguna with 90 cm x 60 cm spacing and split application of N and K at each Harvest	19.75	30.54	45.30	57.90	59.13	61.17	45.66
T ₁₁	Suguna with 60 cm x 60 cm spacing and split application of N at each Harvest	17.62	24.14	37.87	44.87	46.27	47.89	36.45
T ₁₂	Suguna with 60 cm x 60 cm spacing and split application of N and K at each Harvest	16.32	25.26	39.60	48.77	50.41	52.36	38.81
S.Em ±		0.63	0.90	1.27	1.70	1.77	1.74	1.26
CD at 5%		1.86	2.64	3.71	4.98	5.20	5.12	3.69

No. of leaves per clump

Number of leaves per clump (Table 3), a co-component of tillering, followed a similar trend. T₉ recorded the most leaves at the first harvest (171.60 leaves/clump), on par with T₁₀ (159.16). From the second harvest onward T₁₀ was highest (244.64 to 490.00), on par with T₉ (230.56 to 470.20). T₈ was significantly the lowest throughout (82.47 to 257.27). Since each new tiller carries its own leaves, re-

duced competition for light and space in T₉ and T₁₀, together with better nutrient synchrony under the N + K schedule of T₁₀, accounts for these results. Kaur *et al.* (2022) [12] reported that N improved green fodder yield in Bajra-Napier hybrids partly through better canopy development. Wijitphan *et al.* (2009) [13] reported that planting geometry significantly influenced tiller number and leaf development in Napier grass under intensive N and irrigation. Both agree with the present findings.

Table 3. No. of Leaves per clump of Hybrid Napier genotypes influenced by planting geometry and nutrient management at successive harvests.

Treatment		No. of Leaves per clump						Average
		1 st harvest	2 nd harvest	3 rd harvest	4 th harvest	5 th harvest	6 th harvest	
T ₁	Super Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	125.29	167.46	247.22	311.62	324.59	334.36	251.92
T ₂	Super Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	110.65	179.57	261.58	332.65	347.54	358.34	265.10
T ₃	Super Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	102.00	140.56	196.33	254.49	265.53	273.77	205.45

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Treatment		No. of Leaves per clump						Average
		1 st harvest	2 nd harvest	3 rd harvest	4 th harvest	5 th harvest	6 th harvest	
T ₄	Super Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	106.28	155.35	205.94	273.79	283.88	292.62	219.87
T ₅	Red Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	112.40	157.75	226.71	298.96	314.00	323.92	238.96
T ₆	Red Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	105.28	174.77	235.98	315.23	331.10	341.35	250.77
T ₇	Red Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	92.09	139.83	173.90	205.11	214.15	221.04	174.43
T ₈	Red Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	82.47	148.16	196.07	239.83	249.51	257.27	195.55
T ₉	Suguna with 90 cm x 60 cm spacing and split application of N at each Harvest	171.60	230.56	355.09	444.88	454.82	470.20	354.76
T ₁₀	Suguna with 90 cm x 60 cm spacing and split application of N and K at each Harvest	159.16	244.64	378.96	463.84	473.66	490.00	368.66
T ₁₁	Suguna with 60 cm x 60 cm spacing and split application of N at each Harvest	141.01	193.17	303.07	359.07	370.27	383.23	291.69
T ₁₂	Suguna with 60 cm x 60 cm spacing and split application of N and K at each Harvest	130.62	202.20	317.04	390.43	403.56	419.17	310.62
S.Em ±		5.90	8.93	12.75	15.91	16.31	16.76	10.14
CD at 5%		17.31	26.19	37.39	46.65	47.83	49.16	29.73

Leaf:stem ratio

Leaf:stem ratio (Table 4), a quality-linked attribute, showed the opposite response, with the closer-spaced (60 × 60 cm) treatments recording higher ratios. T₁₁ was significantly the highest at the first harvest (1.04), on par with T₁₂ (1.00). From the second harvest onward T₁₂ was highest (1.12 to 1.54), on par with T₁₁ (1.02 to 1.50). T₅ was significantly the lowest throughout (0.51 to 0.79). The ratio depends on how dry matter is partitioned between leaf and stem rather than on absolute leaf production. Under closer spacing, competition for light promotes elongation of leaf blades and sheaths relative to stem thick-

ening, because thin leaves give a better return in intercepted light per unit of carbon than a thick lignified stem under shade. Khadda *et al.* (2016) [4] similarly reported an improved leaf:stem ratio under closer spacing in hybrid Napier in semi-arid Gujarat. Onjai-uea *et al.* (2023) [14], working with purple Napier grass, similarly reported that leaf:stem ratio was significantly influenced by the interaction of cultivar, spacing and harvesting age, underlining that partitioning to leaf versus stem cannot be predicted from tiller number alone. The higher ratio of T₁₁ and T₁₂ is in line with Seeja *et al.* (2006) [9], who described Suguna as having better leafiness and quality attributes than conventional Bajra-Napier hybrids.

Table 4. Leaf to stem ratio of Hybrid Napier genotypes influenced by planting geometry and nutrient management at successive harvests.

Treatment		Leaf to stem ratio						Average
		1 st harvest	2 nd harvest	3 rd harvest	4 th harvest	5 th harvest	6 th harvest	
T ₁	Super Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	0.75	0.77	0.83	0.85	0.85	1.06	0.85
T ₂	Super Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	0.65	0.79	0.84	0.86	0.87	1.09	0.85
T ₃	Super Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	0.77	0.80	0.89	0.89	0.95	1.10	0.90
T ₄	Super Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	0.76	0.83	0.90	0.90	0.98	1.12	0.92
T ₅	Red Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	0.51	0.54	0.63	0.69	0.72	0.79	0.65
T ₆	Red Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	0.45	0.61	0.74	0.70	0.73	0.84	0.68
T ₇	Red Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	0.53	0.70	0.75	0.75	0.74	1.03	0.75
T ₈	Red Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	0.52	0.71	0.78	0.82	0.81	1.04	0.78
T ₉	Suguna with 90 cm x 60 cm spacing and split application of N at each Harvest	0.80	0.84	0.92	0.92	1.00	1.16	0.94
T ₁₀	Suguna with 90 cm x 60 cm spacing and split application of N and K at each Harvest	0.79	0.89	0.96	1.04	1.01	1.30	1.00

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Treatment		Leaf to stem ratio						Average
		1 st harvest	2 nd harvest	3 rd harvest	4 th harvest	5 th harvest	6 th harvest	
T ₁₁	Suguna with 60 cm x 60 cm spacing and split application of N at each Harvest	1.04	1.02	1.10	1.22	1.24	1.50	1.19
T ₁₂	Suguna with 60 cm x 60 cm spacing and split application of N and K at each Harvest	1.00	1.12	1.16	1.27	1.31	1.54	1.23
	S.E.m ±	0.03	0.04	0.04	0.04	0.04	0.06	0.03
	CD at 5%	0.10	0.12	0.13	0.12	0.13	0.17	0.10

Green fodder yield, dry fodder yield and per plant yield at successive harvests are presented in Tables 5 to 7.

Green fodder yield (t/ha)

Green fodder yield, the most important economic trait of a fodder crop, integrates plant height, tillering and leaf production (Table 5). T₁₂ recorded significantly the highest green fodder yield at every harvest and in total (296.69 t/ha), on par with T₁₁ (283.55 t/ha), an improvement of about 4.6 per cent. T₅ was significantly the lowest (141.26 t/ha). T₉ and T₁₀ had the most tillers and leaves per plant, but T₁₁ and T₁₂ gave the highest yield per unit area. The closer spacing accommodates a larger plant population per hectare, which more than

compensates for the lower per-plant vigour. Islam *et al.* (2023) [15] concluded that increasing planting density is among the most reliable ways of raising green and dry matter yield per hectare in Napier grass. Wijitphan *et al.* (2009) [13] reported that closer spacing under intensive N management enhanced Napier grass productivity through improved resource utilization. The additional yield of T₁₂ over T₁₁ is in concurrence with Sathiya Bama (2017) [16], who reported that balanced nutrient management improved green fodder yield and nutrient uptake in Cumbu Napier hybrid. It also agrees with Tiwana *et al.* (2004) [17], who reported that increasing N significantly increased green fodder and dry matter yield of Napier-Bajra hybrids.

Table 5. Green Fodder Yield (t/ha) of Hybrid Napier genotypes influenced by planting geometry and nutrient management at successive harvests.

Treatment		Green Fodder Yield (t/ha)						Total
		1 st harvest	2 nd harvest	3 rd harvest	4 th harvest	5 th harvest	6 th harvest	
T ₁	Super Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	13.10	19.30	35.04	36.72	38.49	39.86	182.59
T ₂	Super Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	12.51	19.65	37.04	38.90	40.73	41.12	189.97
T ₃	Super Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	14.16	21.85	41.30	42.86	44.92	44.33	209.44
T ₄	Super Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	13.39	22.44	44.41	46.09	48.32	48.97	223.91
T ₅	Red Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	10.69	15.95	27.75	28.02	29.34	29.52	141.26
T ₆	Red Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	9.90	16.71	28.14	29.06	30.50	33.72	148.06
T ₇	Red Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	11.80	18.42	33.01	34.26	35.86	36.62	170.05
T ₈	Red Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	11.44	18.69	34.97	36.09	37.72	38.74	177.65
T ₉	Suguna with 90 cm x 60 cm spacing and split application of N at each Harvest	15.52	23.21	48.97	50.33	49.61	50.76	238.48
T ₁₀	Suguna with 90 cm x 60 cm spacing and split application of N and K at each Harvest	13.90	24.64	50.71	52.97	52.69	53.54	248.55
T ₁₁	Suguna with 60 cm x 60 cm spacing and split application of N at each Harvest	19.34	29.28	56.25	58.57	60.86	59.17	283.55
T ₁₂	Suguna with 60 cm x 60 cm spacing and split application of N and K at each Harvest	17.87	30.40	59.36	61.62	64.11	63.11	296.69
	S.E.m ±	0.73	1.00	1.82	1.76	1.96	2.00	8.14
	CD at 5%	2.15	2.93	5.34	5.16	5.73	5.87	23.86

Dry fodder yield (t/ha)

Dry fodder yield (Table 6) followed a trend similar to green fodder yield. T₁₂ recorded the highest total (42.49 t/ha), on par with T₁₁ (40.36 t/ha), and T₆ the lowest (21.30 t/ha). Dry matter accumulation is thus closely tied to green fodder yield potential. The population advantage of closer spacing, together with improved nutrient synchrony,

translates into higher dry biomass per unit area. This agrees with Dokbua *et al.* (2021) [8], who attributed the higher biomass under combined N and K in hybrid napier to sustained vegetative vigour across multiple harvests. Savitha *et al.* (2016) [18], evaluating Napier-Bajra hybrids under Kerala conditions, reported that the Suguna hybrid achieved a green fodder yield of about 137 t/ha under irrigated conditions, underscoring the genotype's inherently high biomass po

tential that the present study's closer-spacing, dual-nutrient treatment appears to have exploited most fully.

Table 6. Dry Fodder Yield (t/ha) of Hybrid Napier genotypes influenced by planting geometry and nutrient management at successive harvests.

Treatment		Dry Fodder Yield (t/ha)						
		1 st harvest	2 nd harvest	3 rd harvest	4 th harvest	5 th harvest	6 th harvest	Total
T ₁	Super Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	2.03	2.66	4.96	5.34	5.63	6.05	26.71
T ₂	Super Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	1.92	2.70	5.22	5.63	5.93	6.20	27.59
T ₃	Super Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	2.22	3.03	5.89	6.27	6.60	6.74	30.75
T ₄	Super Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	2.10	3.10	6.33	6.73	7.09	7.44	32.85
T ₅	Red Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	1.64	2.17	3.89	4.04	4.25	4.43	24.91
T ₆	Red Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	1.51	2.27	3.93	4.16	4.40	5.03	21.30
T ₇	Red Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	1.81	2.53	4.66	4.96	5.21	5.54	24.73
T ₈	Red Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	1.75	2.55	4.91	5.20	5.46	5.81	25.67
T ₉	Suguna with 90 cm x 60 cm spacing and split application of N at each Harvest	2.34	3.13	6.70	7.17	7.10	7.54	34.01
T ₁₀	Suguna with 90 cm x 60 cm spacing and split application of N and K at each Harvest	2.11	3.34	6.95	7.45	7.60	7.70	35.17
T ₁₁	Suguna with 60 cm x 60 cm spacing and split application of N at each Harvest	2.90	3.95	7.76	8.30	8.67	8.75	40.36
T ₁₂	Suguna with 60 cm x 60 cm spacing and split application of N and K at each Harvest	2.69	4.13	8.25	8.79	9.21	9.39	42.49
SE.m ±		0.05	0.12	0.23	0.24	0.25	0.26	1.19
CD at 5%		0.15	0.34	0.66	0.70	0.73	0.77	3.48

Per plant yield (kg /plant)

Per plant yield (Table 7) followed the growth attributes rather than the population-driven area yield, since it reflects individual plant productivity independent of density. T₁₀ recorded the highest (2.33 kg/plant on average), on par with T₉ (2.23 kg/plant), and T₇ the lowest (1.06 kg/plant). Wider spacing therefore gave higher per-plant yield,

while closer spacing gave higher yield per hectare. This shows that plant population determines area-based productivity and that the two measures are complementary. Islam *et al.* (2023) [15] noted a similar dissociation in Napier grass. The higher per plant yield of T₁₀ reflects more efficient conversion of additional tillers and leaf area into forage biomass, consistent with the improved nutrient availability and utilization reported by Sathiya Bama (2017) [16].

Table 7. Per plant Yield (kg/Plant) of Hybrid Napier genotypes influenced by planting geometry and nutrient management at successive harvests.

Treatment		Per plant Yield (kg/Plant)						
		1 st harvest	2 nd harvest	3 rd harvest	4 th harvest	5 th harvest	6 th harvest	Average
T ₁	Super Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	0.71	1.04	1.89	1.98	2.08	2.53	1.71
T ₂	Super Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	0.68	1.06	2.00	2.10	2.20	2.61	1.78
T ₃	Super Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	0.51	0.79	1.49	1.54	1.62	1.88	1.31
T ₄	Super Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	0.48	0.81	1.60	1.66	1.74	2.07	1.39
T ₅	Red Napier with 90 cm x 60 cm spacing and split application of N at each Harvest	0.58	0.86	1.50	1.51	1.58	1.88	1.32
T ₆	Red Napier with 90 cm x 60 cm spacing and split application of N and K at each Harvest	0.53	0.90	1.52	1.57	1.65	2.14	1.39

(continued on next page)

Treatment		Per plant Yield (kg/Plant)						Average
		1 st harvest	2 nd harvest	3 rd harvest	4 th harvest	5 th harvest	6 th harvest	
T ₇	Red Napier with 60 cm x 60 cm spacing and split application of N at each Harvest	0.42	0.66	1.19	1.23	1.29	1.55	1.06
T ₈	Red Napier with 60 cm x 60 cm spacing and split application of N and K at each Harvest	0.41	0.67	1.26	1.30	1.36	1.64	1.11
T ₉	Suguna with 90 cm x 60 cm spacing and split application of N at each Harvest	0.84	1.25	2.64	2.72	2.68	3.22	2.23
T ₁₀	Suguna with 90 cm x 60 cm spacing and split application of N and K at each Harvest	0.80	1.33	2.74	2.86	2.85	3.40	2.33
T ₁₁	Suguna with 60 cm x 60 cm spacing and split application of N at each Harvest	0.70	1.05	2.03	2.11	2.19	2.51	1.77
T ₁₂	Suguna with 60 cm x 60 cm spacing and split application of N and K at each Harvest	0.64	1.09	2.14	2.22	2.31	2.67	1.85
SE.m ±		0.03	0.05	0.09	0.09	0.09	0.11	0.06
CD at 5%		0.09	0.13	0.25	0.26	0.27	0.33	0.18

Conclusion

The study revealed that Suguna genotype grown at 60 cm × 60 cm spacing with split application of nitrogen and potassium (T₁₂) recorded higher growth and yield parameters of Hybrid Napier. However, it was on par with Suguna genotype grown at 60 cm × 60 cm spacing with split application of nitrogen alone (T₁₁), and the lowest was generally recorded in Red Napier genotype grown with split application of nitrogen alone, at 60 cm × 60 cm spacing (T₇) for tillers, leaves and per plant yield, and at 90 cm × 60 cm spacing (T₅) for leaf:stem ratio and green fodder yield; plant height alone was lowest in Suguna genotype grown at 90 cm × 60 cm spacing with nitrogen and potassium (T₁₀).

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